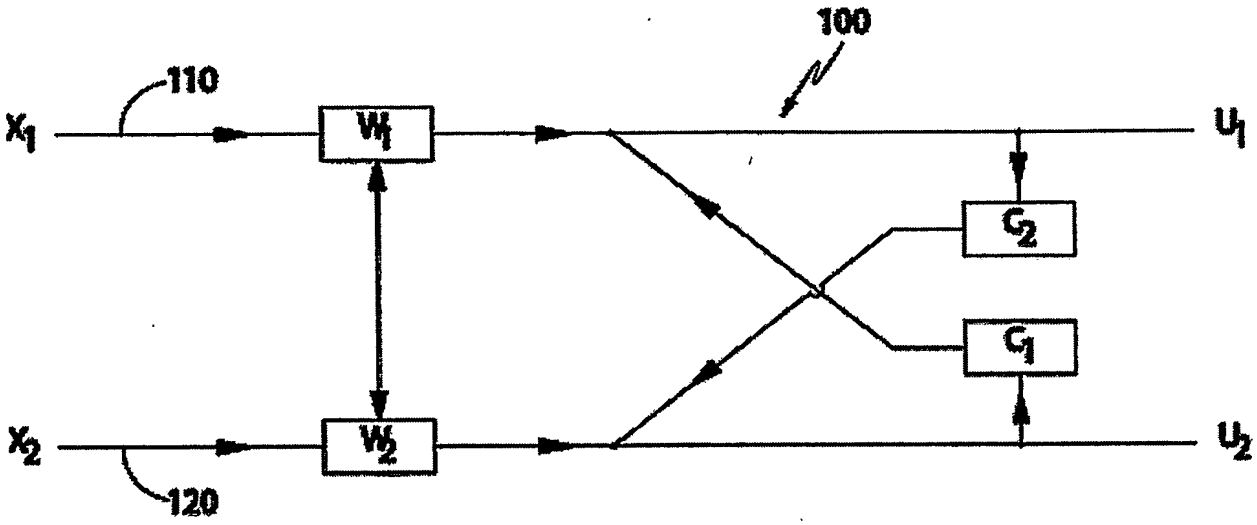

FIG. 1
(PRIOR ART)

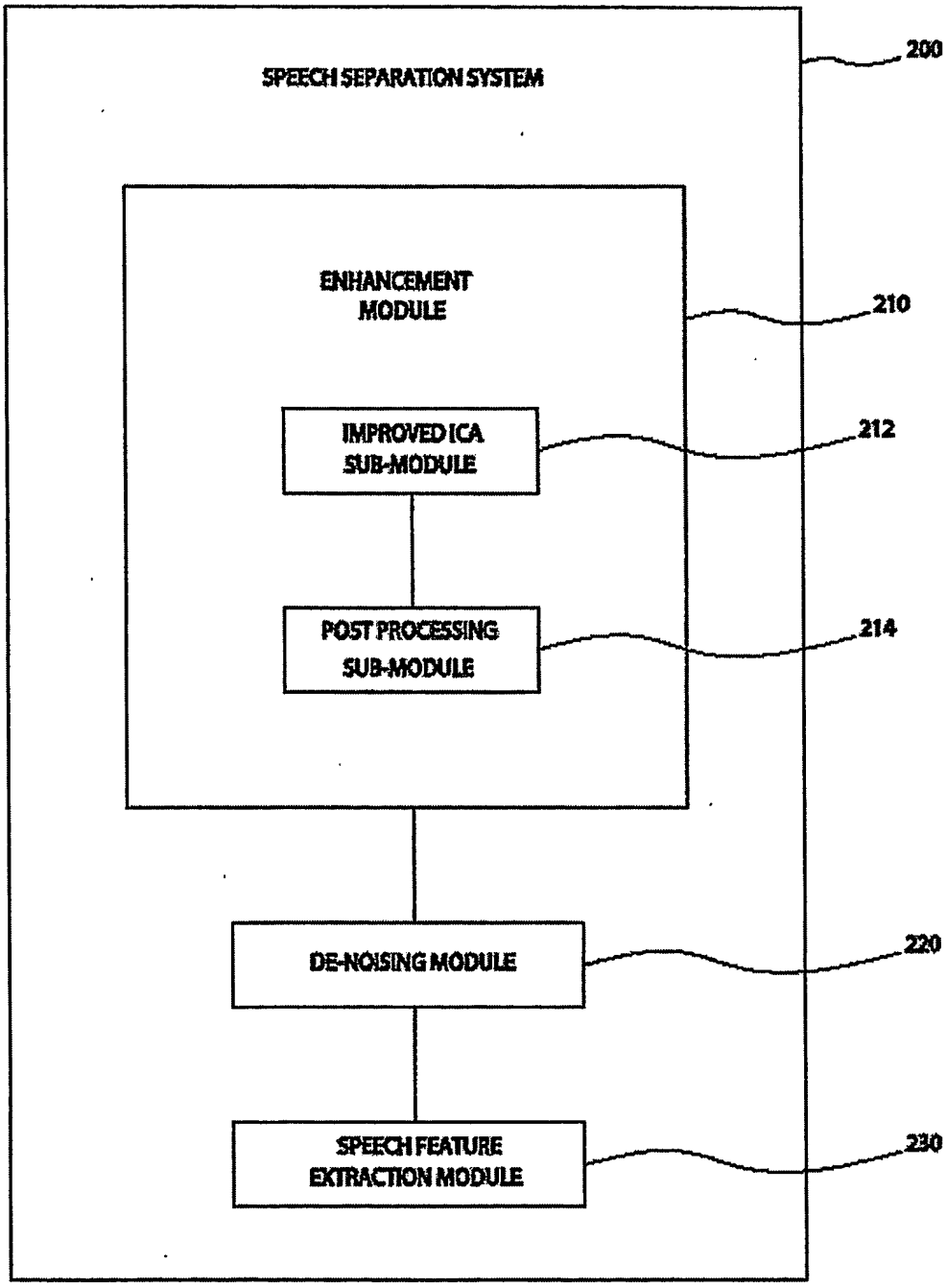
SPEECH SEPARATION SYSTEM
200
ENHANCEMENT MODULE
210
IMPROVED ICA SUB-MODULE
212
POST PROCESSING SUB-MODULE
214
DE-NOISING MODULE
220
SPEECH FEATURE EXTRACTION MODULE
230

FIG. 2

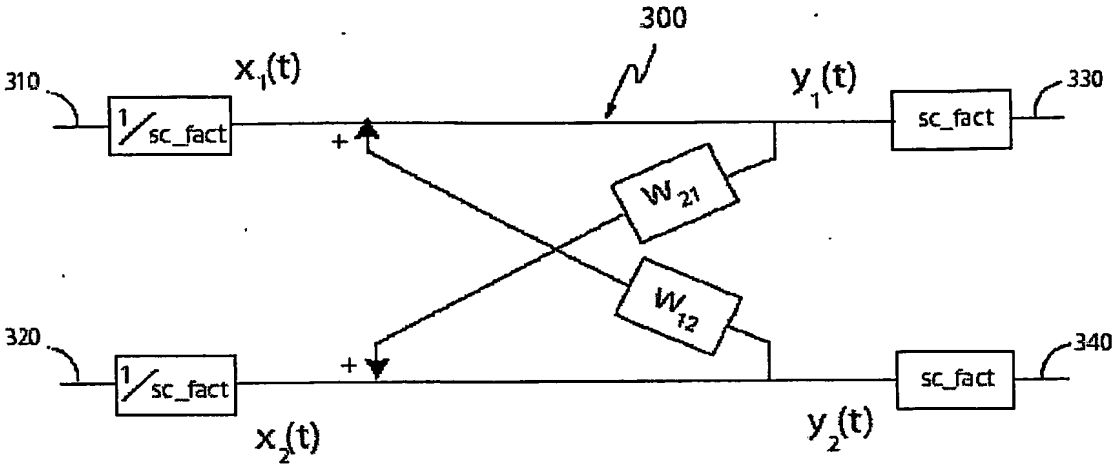
300
310
$x_1(t)$
1/sc_fact
$y_1(t)$
330
sc_fact
+
W_{21}
W_{12}
320
1/sc_fact
+
340
sc_fact
$x_2(t)$
$y_2(t)$

FIG. 3

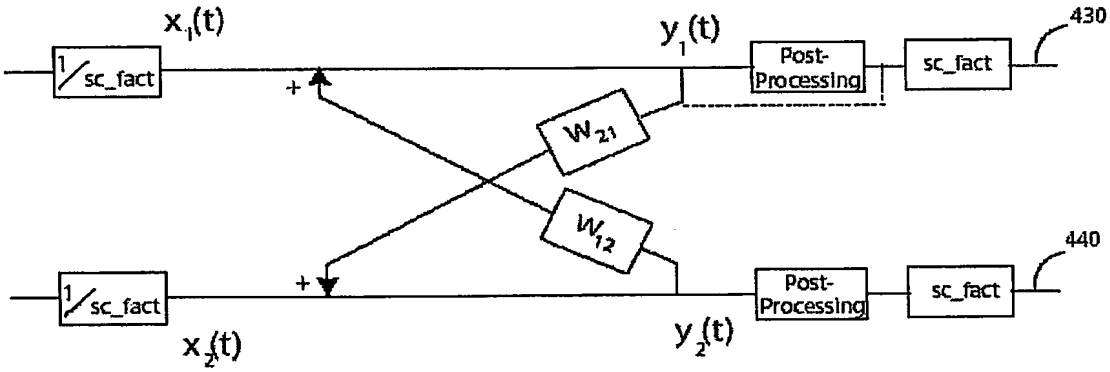
$x_1(t)$
1/sc_fact
+
$y_1(t)$
Post-Processing
sc_fact
430
W_{21}
W_{12}
1/sc_fact
+
Post-Processing
sc_fact
440
$x_2(t)$
$y_2(t)$

FIG. 4

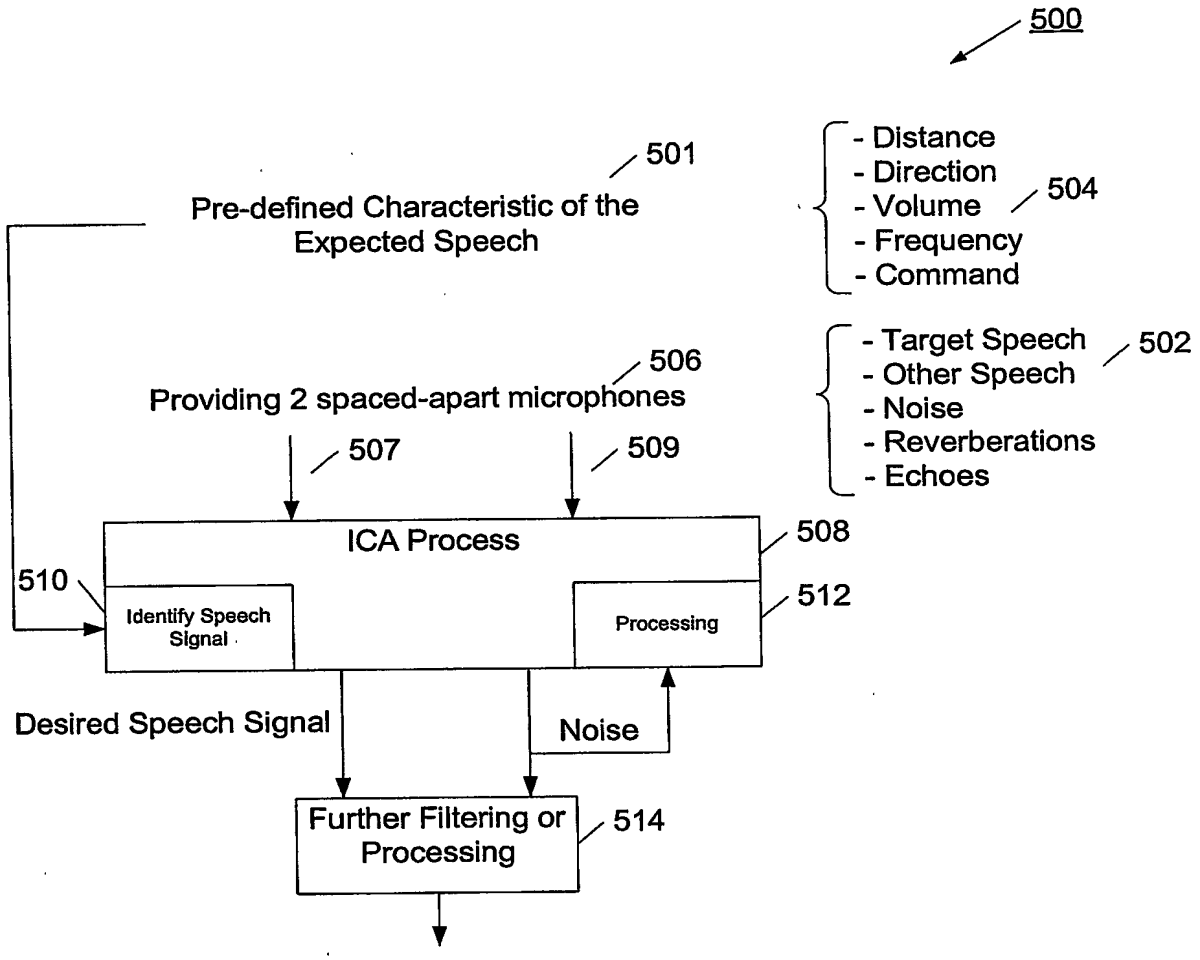
500
501
Pre-defined Characteristic of the Expected Speech
- Distance
- Direction
- Volume
- Frequency
- Command
504
- Target Speech
- Other Speech
- Noise
- Reverberations
- Echoes
502
506
Providing 2 spaced-apart microphones
507
509
ICA Process
508
510
Identify Speech Signal
Processing
512
Desired Speech Signal
Noise
Further Filtering or Processing
514

FIG. 5

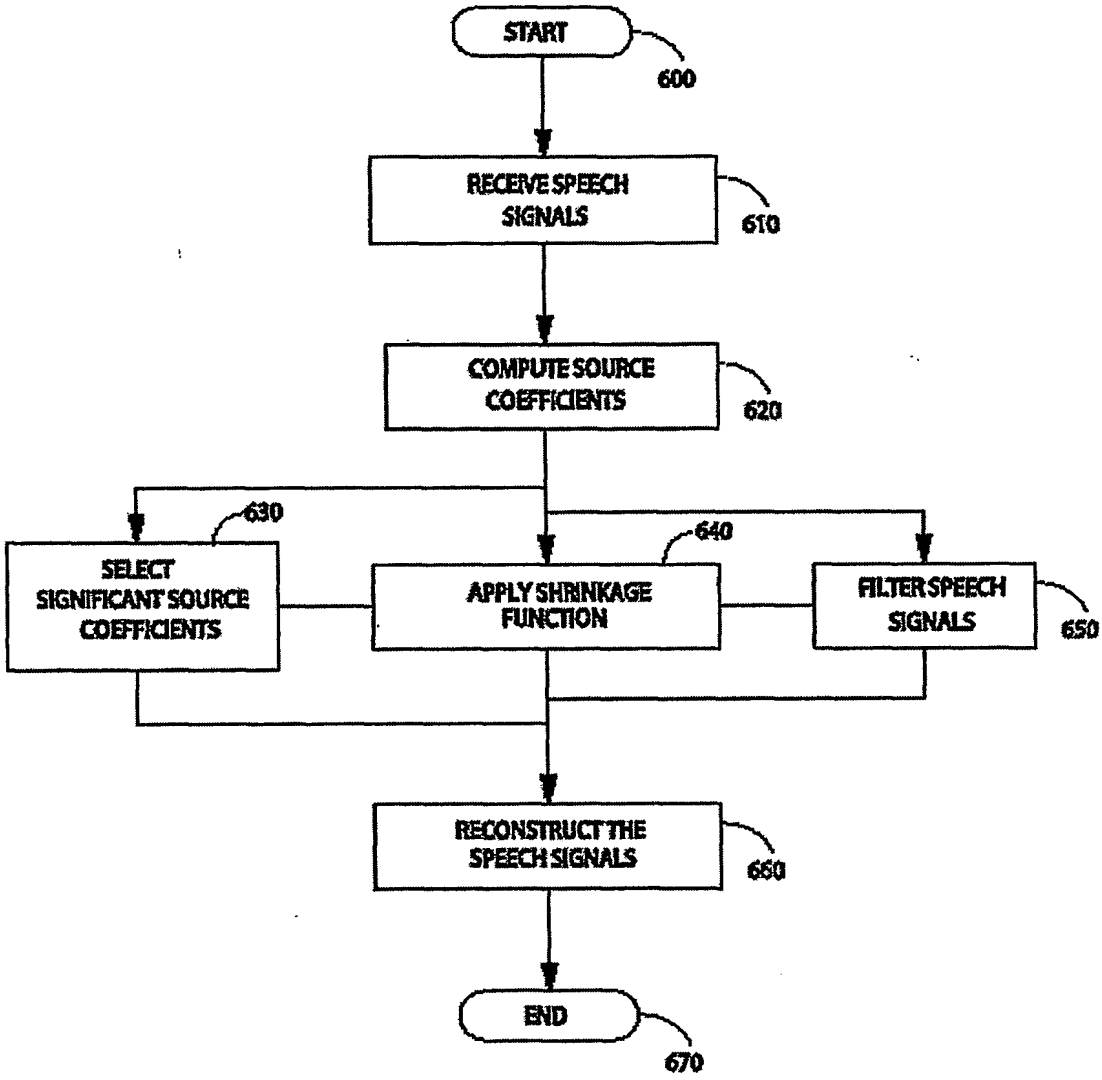
START
600
RECEIVE SPEECH SIGNALS
610
COMPUTE SOURCE COEFFICIENTS
620
630
SELECT SIGNIFICANT SOURCE COEFFICIENTS
640
APPLY SHRINKAGE FUNCTION
FILTER SPEECH SIGNALS
650
RECONSTRUCT THE SPEECH SIGNALS
660
END
670

FIG. 6

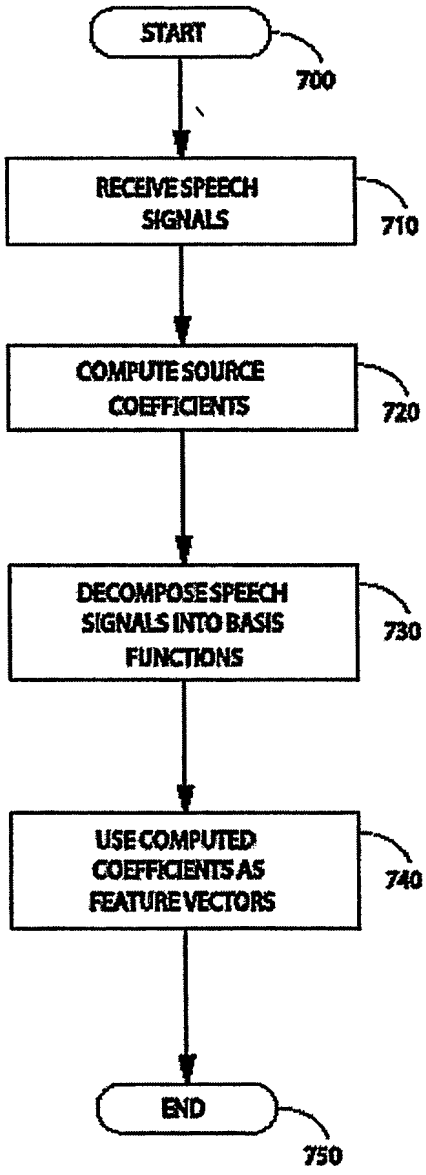
START
700
RECEIVE SPEECH SIGNALS
710
COMPUTE SOURCE COEFFICIENTS
720
DECOMPOSE SPEECH SIGNALS INTO BASIS FUNCTIONS
730
USE COMPUTED COEFFICIENTS AS FEATURE VECTORS
740
END
750

FIG. 7

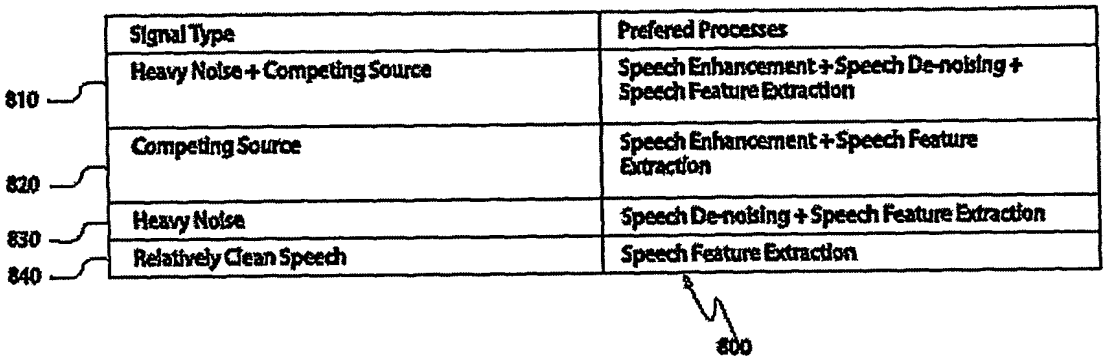
Signal Type
Prefered Processes
Heavy Noise + Competing Source
Speech Enhancement + Speech De-noising + Speech Feature Extraction
Competing Source
Speech Enhancement + Speech Feature Extraction
Heavy Noise
Speech De-noising + Speech Feature Extraction
Relatively Clean Speech
Speech Feature Extraction
810
820
830
840
800

FIG. 8

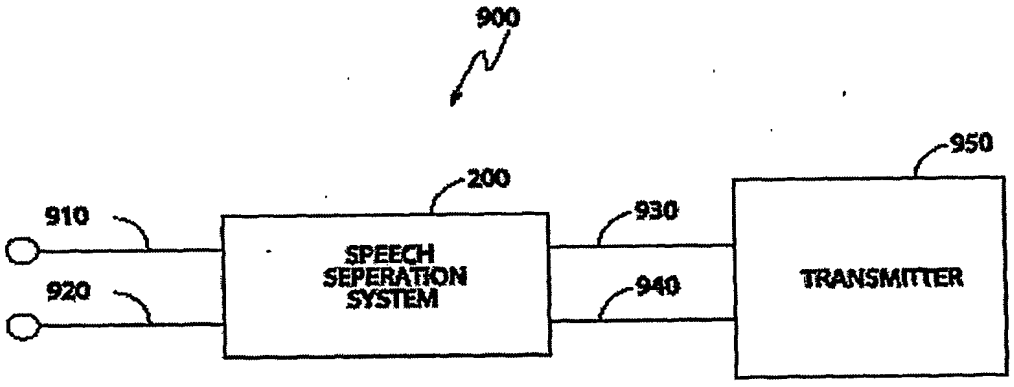
900
910
920
200
SPEECH SEPERATION SYSTEM
930
940
950
TRANSMITTER

FIG. 9

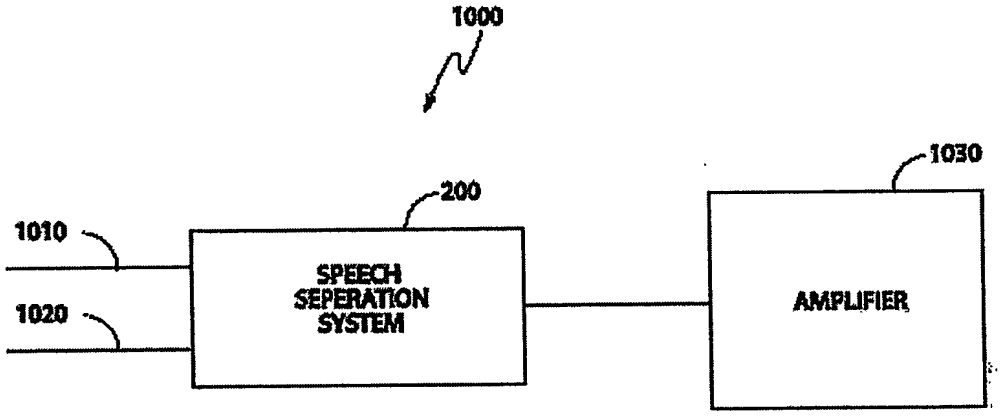
1000
1030
200
1010
1020
SPEECH SEPERATION SYSTEM
AMPLIFIER

FIG. 10